

Studies of Plum Pox Virus: Development of Advanced Detection Technology and Molecular Epidemiological Analysis

Kensaku Maejima (Graduate School of Agricultural and Life Sciences, The University of Tokyo)
amaejima@mail.ecc.u-tokyo.ac.jp

Plum pox virus (PPV) has seriously damaged the production of stone fruits such as plum, peach, and apricot in Europe for about 100 years as one of the most important viruses of fruit trees. In recent years, there have been several occurrences of PPV in various parts of the world, and its eradication has been attempted in each country. The diagnosis of PPV, however, depends on traditional time-consuming techniques such as ELISA and RT-PCR, and control measures based on the epidemiological analysis of the virus are not taken. Therefore, in many cases, eradication of PPV is difficult. In 2009, through plant diagnostic services of the Plant Clinic of the University of Tokyo, we confirmed PPV infection of Japanese apricot trees in Ome, Tokyo [1]. This was the first report of the invasion of PPV in Japan, as well as of natural infection and the spread of PPV on Japanese apricot. Following the report, the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan initiated the nationwide detection surveys and an eradication program for PPV. To support these plant quarantine activities, we developed and commercialized the most simple, quick and highly sensitive on-site diagnostic kits based on immunochromatography [2] and RT-LAMP, which can detect PPV within 15 and 60 minutes, respectively, without special laboratory equipment. These kits were officially adopted for the PPV eradication program of MAFF, and more than 25 thousand PPV-infected trees have been identified in twelve prefectures by inspection of more than 2 million stone fruit trees. In addition, we developed a molecular epidemiological analysis method using complete genome information of PPV, and studied for the first time the global and domestic dynamics of PPV propagation pathways [3]. This analysis revealed that PPV had been introduced from Europe into Japan, the United States, and Canada, via independent routes. Moreover, we identified that the unexpected occurrence of PPV in Japanese apricot collection gardens in Kanagawa and Ibaraki had been derived from PPV-infected scions provided by an orchard in Ome, Tokyo. Through the above research, the Plant Clinic of the University of Tokyo contributed to the prevention of PPV spread in Japan.

References

- [1] Maejima K., Hoshi H., Hashimoto M., Himeno M., Kawanishi T., Komatsu K., Yamaji Y., Hamamoto H. and Namba S.: *J Gen Plant Pathol* 76: 229–231 (2010).
- [2] Maejima K., Himeno M., Netsu O., Ishikawa K., Yoshida T., Fujita N., Hashimoto M., Komatsu K., Yamaji Y. and Namba S.: *J Gen Plant Pathol* 80: 176–183 (2014).
- [3] Maejima K., Himeno M., Komatsu K., Takinami Y., Hashimoto M., Takahashi S., Yamaji Y., Oshima K. and Namba S.: *Phytopathology* 101: 567–57 (2011).